MISSISSIPPI RIVER/GULF OF MEXICO
WATERSHED NUTRIENT TASK FORCE

GULF HYPOXIA ACTION PLAN 2008

FOR REDUCING, MITIGATING, AND CONTROLLING HYPOXIA IN THE NORTHERN GULF OF MEXICO AND IMPROVING WATER QUALITY IN THE MISSISSIPPI RIVER BASIN

DRAFT VERSION FOR PUBLIC REVIEW

CONTENTS

MOVING FORWARD ON GULF HYPOXIA

More than thirty years after the passage of the Clean Water Act, a large area of low oxygen or hypoxia, absent most marine life and threatening to inexorably change the biology of the region, continues to form in the Gulf of Mexico during periods in the summer off the coasts of Louisiana and Texas. The hypoxia is primarily caused by excess nutrients — originating from the great productivity of Middle American cities, farms, and industries — which cause extensive growths of algae that deplete the oxygen in the water when they die, sink to the bottom, and decompose. The condition is exacerbated by the stratification of the water column — the result of surface water warming and low salinity surface waters that isolate the organic-rich bottom waters from the surface and prevent oxygen exchange with the atmosphere — which occurs where the Mississippi River meets the Gulf of Mexico.

The watershed of the Mississippi River drains 41 percent of the contiguous United States and includes waters from several major river systems, including the Missouri-Platte River Basin, the Ohio-Tennessee River Basin, and the Arkansas-Red-White River Basin. The Mississippi River basin includes two functionally distinct zones, each with its own potential to contribute to the reduction of Gulf hypoxia. These zones include the huge Mississippi watershed with its tributary network, and at the lower end of the river system, the deltaic zone that formerly dispersed river water naturally throughout SE Louisiana via a distributary (deltaic) network. While the tributaries of the Mississippi River are the sources of nutrient loading to the river trunk, the distributaries within the Mississippi Delta are critical to the final dispersal of nutrients and sediments into the Gulf of Mexico, and the salinity of the estuaries and coastal waters.

The distributary zone includes the entire area influenced by river flow south of the Old River Control Structures, where the Atchafalaya River diverges from the lower Mississippi River and the Red River merges with the Atchafalaya (Figure 1). During the past two centuries the hydrology of the distributary zone was totally modified by the construction of flood levees and closing of key distributaries for flood control and navigation enhancement programs. These structures isolated the river from its delta, causing an ongoing catastrophic collapse in the deltaic landscape, primarily wetlands. The hydrologic changes that have caused such damage to South Louisiana also exacerbate Gulf hypoxia by jetting most nutrient-rich river water and sediments directly into the Gulf of Mexico, bypassing the deltaic wetlands that require the nutrients and sediments.

States and Tribes within the entire Mississippi/Atchafalaya River Basin and Federal agencies are working together to take action to reduce the size of the hypoxic zone, while protecting and restoring the human and natural resources of the Mississippi River Basin. In January 2001, the Mississippi River/Gulf of Mexico Watershed Nutrient Task Force issued the Action Plan for Reducing, Mitigating, and Controlling Hypoxia in the Northern Gulf of Mexico. The plan stimulated a great deal of collaboration in understanding science and planning; however, much work remains to be done to implement this plan.

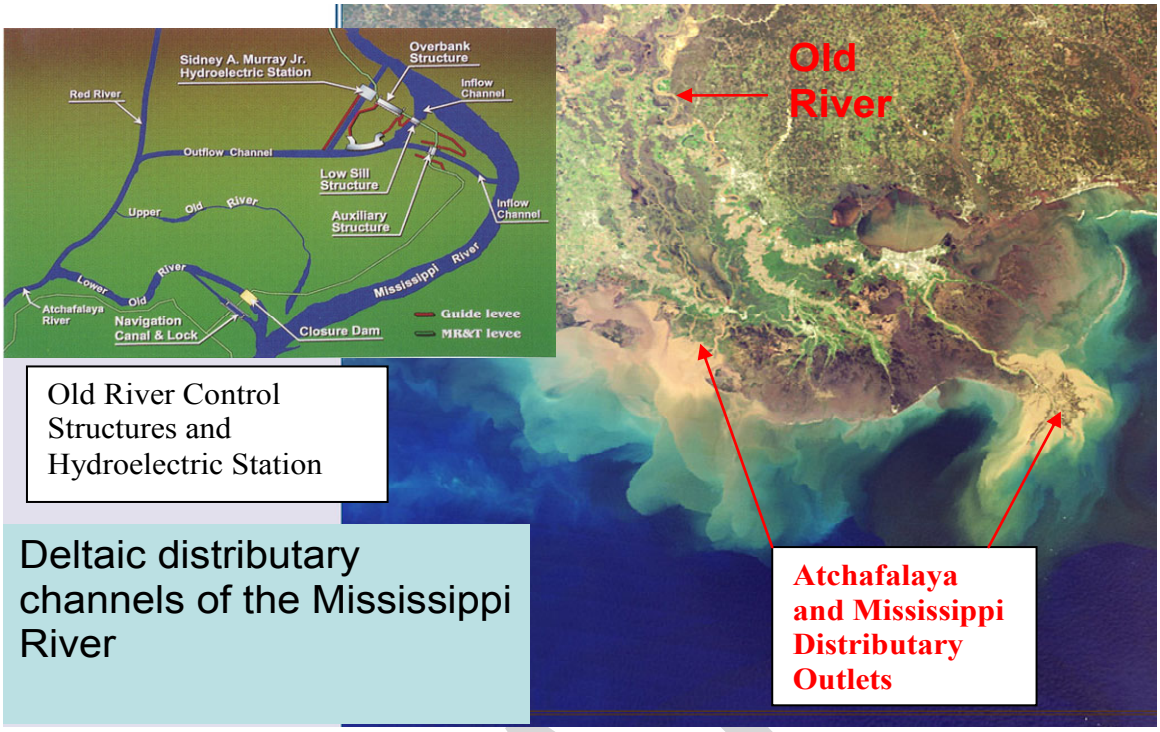


Figure 1. Deltaic plain of Louisiana showing land built, maintained and nourished over thousands of years by many distributary channels of the Mississippi River, including the two that are currently active.

The Task Force is updating this initial plan through a multiple-step reassessment. This *2008 Action Plan* reflects the Task Force's efforts to track progress, update the science, and adapt our actions to improve the effectiveness of the efforts throughout the basin. Building on the *2001 Action Plan,* this plan lays out specific steps that need to be accomplished to reach the goals. It also reiterates the long term goals and continues the Task Force's commitment to an adaptive management approach to reducing the size and impact of the Gulf hypoxic zone and improving water quality in the Basin. This adaptive management approach involves continual feedback between the interpretation of new information and improved management actions and is the key to targeting actions within watersheds where they will be most effective.

Six major policy themes provided direction for the reassessment. These themes address needed improvements to the *2001 Action Plan* within the adaptive management framework and include:

1. ***Acknowledge the context changes and links to emerging issues and policies.*** The vast drainage basin of the Mississippi/Atchafalaya River Basin and the adaptive management framework of the action plan require that the Task Force analyze the broad landscape and policy changes that impact the hypoxic zone and water quality in the basin. These trends may include wetland trends in both the upper and lower basin, channelization of the Mississippi River and how it affects the hydrology of the Mississippi and Atchafalaya deltas, and the role of energy and agriculture markets on land use in the Mississippi/Atchafalaya River Basin.

2. ***Ensure greater specificity and accountability and tie to funding strategies.*** The Task Force must identify the appropriate actions, and engage State, Tribal and Federal agencies and stakeholders to identify the appropriate funding strategies that will be the most effective in ensuring timely implementation to achieve measurable and effective results.

3. ***Track program and environmental progress.*** The Task Force needs to improve communication and understanding of our efforts, and improve tracking and integration of results into improved design and targeting of adaptive strategies in future reassessments.

4. ***Adapt to new scientific findings.*** The Task Force has been active in soliciting and evaluating the latest scientific findings through a series of symposia on relevant topics and advice from a panel of experts under the EPA's Science Advisory Board.

5. ***Maximize opportunities for stakeholder involvement.*** Given the cooperative and voluntary nature of the Action Plan, the Task Force must engage a wide range of stakeholders and facilitate broad acceptance of the plan in order to maximize opportunities for stakeholders to pursue the identified actions.

6. ***Reexamine roles and responsibilities of Task Force partners.*** A reassessment of the roles and responsibilities assigned to the Federal agencies, the States and Tribes, and the Sub-Basin Committees in achieving the goals of the Action Plan will improve future implementation and action.

FRAMEWORK FOR ACTION

PRINCIPLES

Throughout the process of the reassessment, the Task Force has reaffirmed these six, overarching principles as guidance to reach the three major goals of this plan:

- Encourage actions that are voluntary, practical and cost-effective;
- Utilize existing programs, including existing state and federal regulatory mechanisms;
- Follow adaptive management;
- Identify additional funding needs and sources during the annual Agency budget process
- Identify opportunities for, and potential barriers to, innovative and market-based solutions; and,
- Provide measurable outcomes as outlined below in the three goals and strategies

GOALS

The Task Force has revised and reaffirmed the three goals that conform to these principles and will provide the overall measure of the results of the plan:

Coastal Goal: Subject to the availability of additional resources, we strive to reduce or make significant progress towards reducing the 5-year running average areal extent of the Gulf of Mexico hypoxic zone to less than 5,000 square kilometers by the year 2015 through implementation of specific, practical, and cost effective voluntary actions by all Federal agencies, States, and Tribes, and address all categories of sources and removals within the Mississippi/Atchafalaya River Basin to reduce the annual discharge of nitrogen and phosphorus into the Gulf.*

Within Basin Goal: To restore and protect the waters of the 31 States and Tribal lands within the Mississippi/Atchafalaya River Basin through implementation of nutrient and sediment reduction actions to protect public health and aquatic life as well as reduce negative impacts of water pollution on the Gulf of Mexico.

Quality of Life Goal: To improve the communities and economic conditions across the Mississippi/Atchafalaya River Basin, in particular the agriculture, fisheries and recreation sectors, through improved public and private land management and a cooperative, incentive based approach.

* The Task Force understands the difficulty of meeting the 2015 goal so is therefore including a revision that takes into account the uncertainty of the task but attempts to maintain momentum and progress achieved to date. As such, at this time, the Task Force accepts the advice of EPA's Science Advisory Board on this topic…*"The 5,000 km2 target remains a reasonable endpoint for continued use in an adaptive management context, however it may no longer be possible to achieve this goal by 2015…it is even more important to proceed in a directionally correct fashion to manage factors affecting hypoxia than to wait for greater precision in setting the goal for the size of the zone. Much can be learned by implementing management plans, documenting practices, and measuring their effects with appropriate monitoring programs."* (Science Advisory Board Hypoxia Panel Draft Advisory Report, p.2).

CRITICAL NEEDS

Much planning and implementation is under way at the local level, as well as through federal and state programs, to address scientific and management concerns and to put the conservation and management practices and technologies in place to reduce nutrient loads. Progress is being made; however, it is ongoing programs, rather than new initiatives, that are responsible for most of the progress. Furthermore, progress is often the result of collateral benefits from actions states and the

Federal agencies have taken independent of the hypoxia action plan to generally improve the state of the science, restore local water quality, or improve the efficiency of industrial and agricultural activities. The Task Force members are committed to continue, within these existing programs, current activities that contribute to meeting the goals of this plan, while increasing the targeting within this reassessment to fill gaps that are observed within the existing programs.

However, while landowners, States and Federal agencies have undertaken numerous nutrient reduction activities, these activities have not resulted in a reduction of the hypoxic zone. Resources are insufficient to attain the goals of the Action Plan and the lack of resources is the primary barrier to successful implementation of the plan. To achieve a reduction in the size of the hypoxic zone, significant resources must be provided at all levels of government and non-governmental organizations, and targeted toward implementing the most effective nutrient reduction actions in the states of the Mississippi River Basin with the greatest loadings of nitrogen and phosphorus to the Gulf. The difference between the results that might be achieved using existing programs and resources and the results that would be realized with additional legislative, regulatory, or financial support is considerable. These specific, critical needs are summarized later in this document and are defined more precisely in the operating plan that accompanies this document.

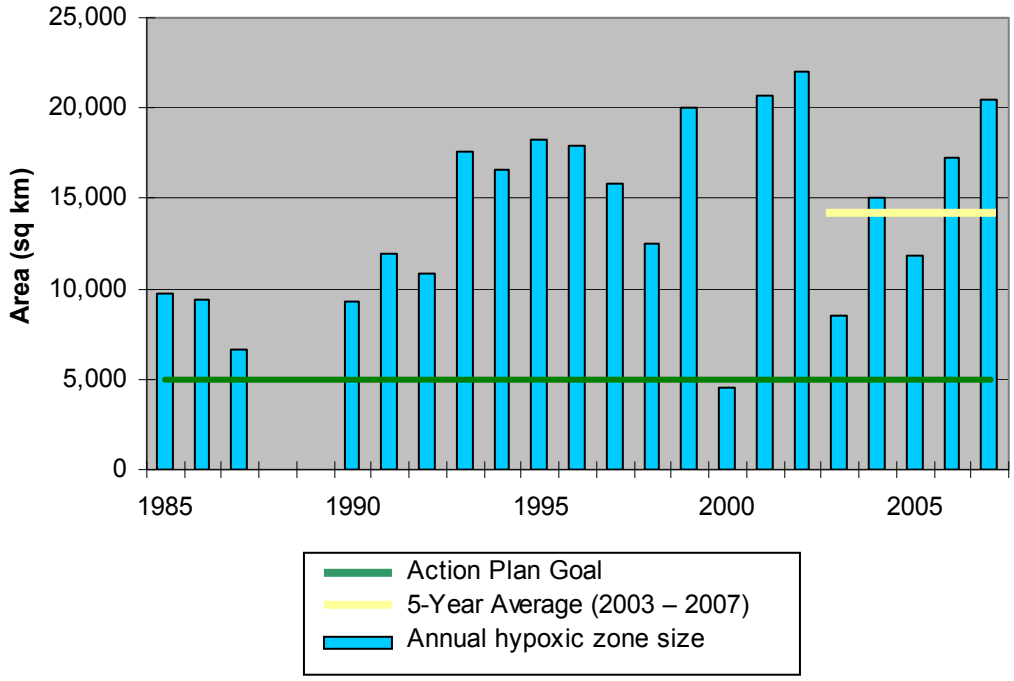
[The operating plan described in the paragraph above is under development and will be published concurrently with the Gulf Hypoxia 2008 Action Plan]

PROGRESS AND REASSESSMENT 2001-2007

TRENDS IN THE SIZE OF THE HYPOXIC ZONE

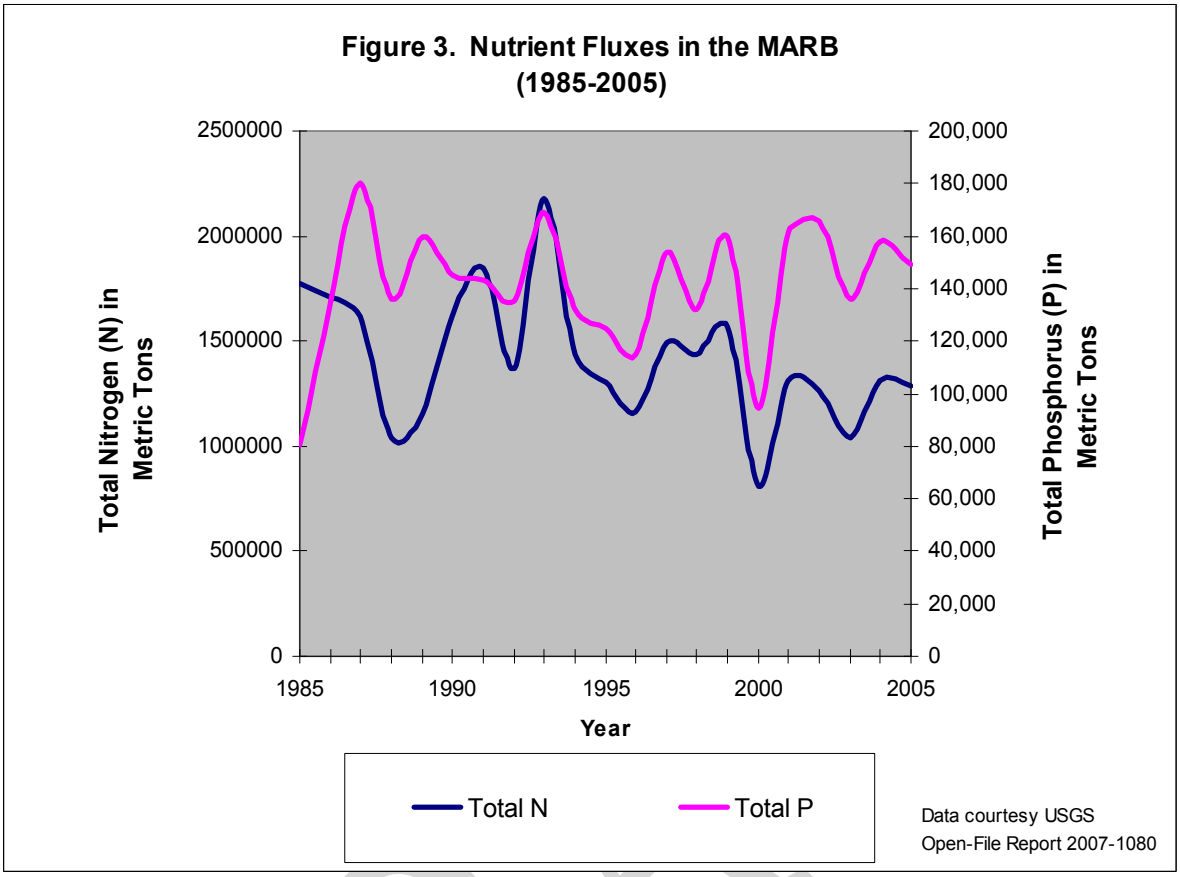
The hypoxic zone in the Northern Gulf of Mexico forms each summer, and can extend up to 80 miles offshore and stretch from the mouth of the Mississippi River westward to Texas coastal waters. The size of the hypoxic zone varies considerably each year, depending on natural and anthropogenic factors. In 2007, the measured size of the hypoxic zone was 20,500 square kilometers (7,900 square miles), about the size of the state of Massachusetts, the third largest hypoxic zone since measurements began in 1985 (see Fig. 2). The goal of this Action Plan is to reduce the 5-year running average size of the zone to less than 5,000 square kilometers (about 1,900 square miles). The current five-year average (2003-2007), is 14,644 square kilometers (4,200 square miles), more than twice the size of the goal.

Figure 2. Size of Gulf Hypoxic Zone (1985 – 2007)



TRENDS IN NITROGEN AND PHOSPHORUS IN THE BASIN

With a twenty-year average (1985-2005) annual stream flow of over 20,000 cubic meters per second (m^3/s), the Mississippi River carries large amounts of sediments and nutrients from its watershed, resulting in large nutrient fluxes delivered to the Gulf of Mexico at the river terminus. Nutrient fluxes vary greatly, and are positively related to streamflow. According to the United States Geological Survey (USGS), between 1985 and 2005, nutrient fluxes ranged from lows of 810,000 metric tons of nitrogen and 80,700 metric tons of phosphorus to highs of 2,210,000 and 180,000 metric tons of nitrogen and phosphorus respectively (see Fig 3).



It is especially important to understand the sources of these nutrient loads that flow into the Gulf of Mexico. Analysis of five-year averages, from 2001-2005, of nutrient loads from the various sub-basins indicates that 80% of the nitrogen load delivered to the Gulf of Mexico came from the Ohio/Tennessee and Upper Mississippi River sub-basins (figure 4), which contributed 41% and 39% of the load respectively. Similar analysis shows that from 2001-2005, the Ohio/Tennessee and Upper Mississippi River sub-basins were the greatest contributors of phosphorus loads to the Gulf of Mexico as well, contributing 38% and 26% respectively (figure 5). The Missouri/Platte sub-basin, Lower Mississippi sub-basin, and Arkansas/Red sub-basin contributed 20%, 10%, and 6% respectively.

Figure 4. Nitrogen Loads to the Gulf by Basin (2001-2005 average %)

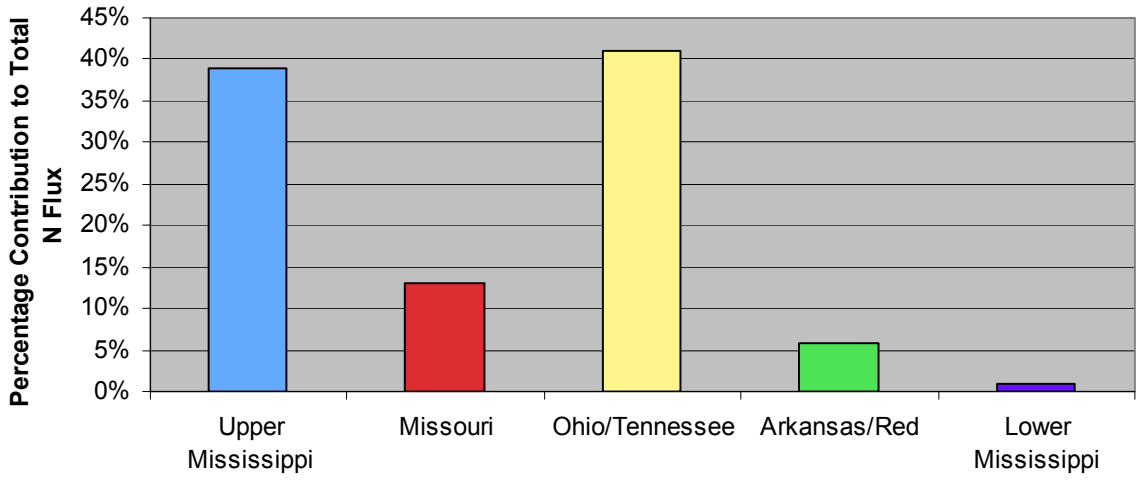
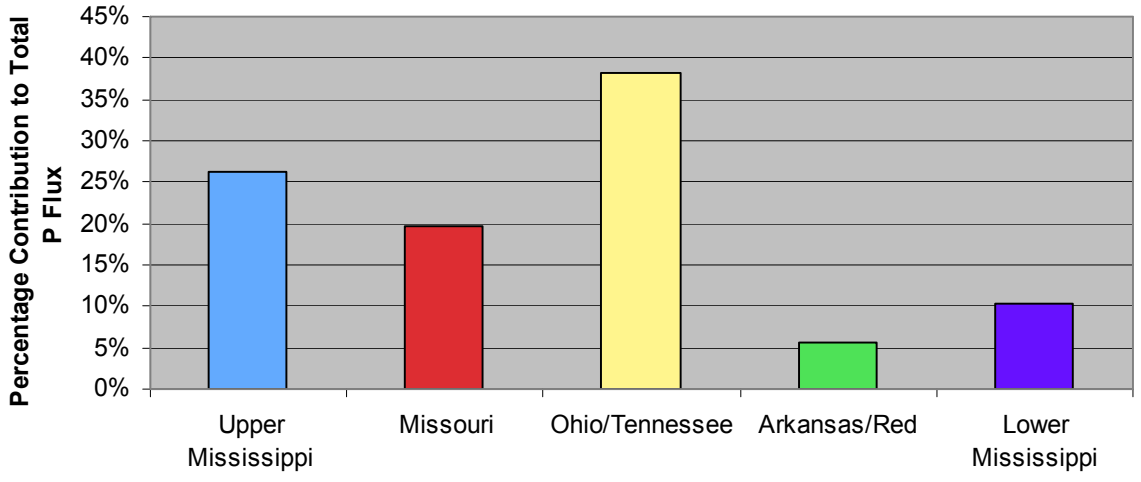


Figure 5. Phosphorus Loads to the Gulf by Basin (2001-2005 average %)



Figures 6 and 7 show both the long term average and the most recent 5-year average (for which data is available) nitrogen and phosphorus fluxes for each Sub-basin in the Mississippi/Atchafalaya River Basin.

Figure 6. MARB Nitrogen Flux by Sub-basin

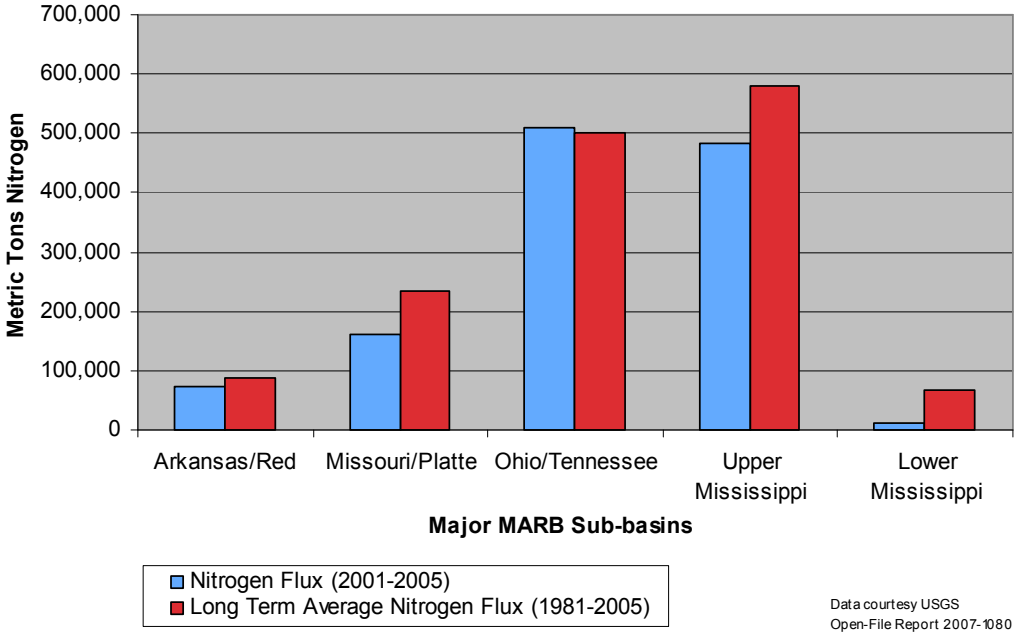
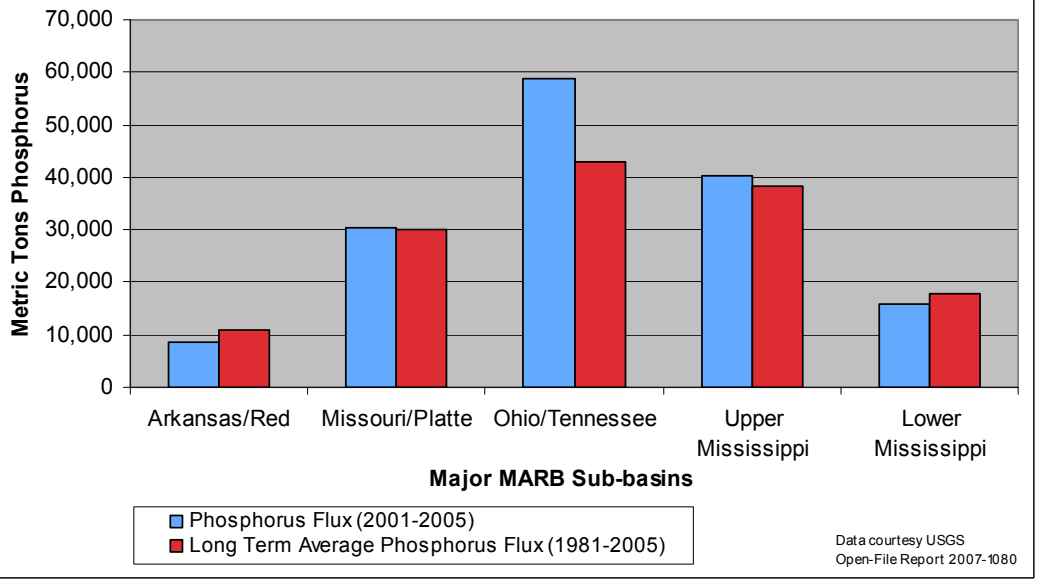


Figure 7. MARB Phosphorus Flux by Sub-basin



Overall, total annual loads to the Gulf from 2001-2005 show a 21% decline in nitrogen flux and a 12% increase in phosphorus flux when compared to averages from the 1980-1996 period (see Figure 2). However, because of the complex interactions regarding nutrient fate and transport, and the existing uncertainties surrounding the linkages between nutrient fluxes and the size, duration and

severity of the hypoxic zone, these changes are difficult to relate to changes in the measured size of the zone.

PROGRESS ON ACTIONS IN THE 2001 ACTION PLAN

Of the eleven actions identified in the *2001 Action Plan*, several have made significant progress:

- The States established Sub-Basin Committees for the Upper Mississippi Basin, the Ohio Basin and the Lower Mississippi Basin. These committees have worked to coordinate actions in the sub-basin states. The Sub-Basin Committees have opened the discussion to include many stakeholders not represented on the Task Force, including additional basin states, state agencies, and interested parties and organizations. (*Action 2 of 2001 Action Plan*)
- The Task Force issued an integrated monitoring, modeling and research strategy, or MMR, for the Basin and Gulf to guide the development of the nutrient reduction strategies as well as future scientific research. The MMR report was a driver for research strategies of NOAA's Northern Gulf of Mexico Ecosystems and Hypoxia Assessment Program (NGOMEX), which supported studies advancing understanding of causes and impacts of the hypoxia zone. (*Action 3 of 2001 Action Plan*)
- After detailed planning and building on the recommendations of the MMR, NOAA conducted additional monitoring of the hypoxic zone on a seasonal and annual basis, though this has not "greatly expanded" the long-term monitoring program, as many important needs persist (see next section). (*Action 4 of 2001 Action Plan*)
- Higher resolution spatial data were added to models, such as SPARROW and SWAT, to facilitate their use on smaller watersheds, and to identify additional management actions that could decrease transport of nutrients into small watersheds throughout the Mississippi/Atchafalaya River Basin and ultimately into the Gulf. The National Water Quality Monitoring Council adopted a framework to improve monitoring in the Basin, which will strengthen the data needed for further enhancing these models. (*Action 5 of 2001 Action Plan*)
- The Ohio and the Lower Mississippi Sub-Basins began development of nutrient reduction strategies at the Sub-Basin level, incorporating specific issues and proposals from the states within those basins. (*Action 6 of 2001 Action Plan*)
- Increased assistance to agricultural producers through USDA programs for voluntary actions resulted in an additional 1.4 million acres of wetlands restored, enhanced, or created and an additional 2.3 million acres of conservation buffers installed within in the Basin during fiscal years 2000-2006 (*Action 9 of Action Plan).*
- Increased assistance to agricultural producers through USDA programs for the voluntary implementation of best management practices which are effective in addressing loss of nutrients to water bodies has resulted in conservation tillage/residue management practices applied to 20.8 million acres and nutrient management applied to 18.3 million acres in the Basin during fiscal years 2000-2006. A total of 42.8 million acres of

conservation tillage, nutrient management, wetland, and conservation tillage practices were applied not counting additional areas impacted by wetland and buffer practices *(Action 10 of Action Plan).*

- The Task Force completed a major reassessment of the science and actions to support the Action Plan principle of adaptive management. (*Action 11 of 2001 Action Plan*)

However, some of the actions called for in the 2001 plan have not been initiated, authorized or completed:

- An integrated federal budget to support voluntary actions to reduce nutrient pollution in the Basin and the size of the hypoxic zone in the Gulf was never finalized. (*Action 1 of 2001 Action Plan*)
- The long-term monitoring program for the hypoxic zone has not been "greatly expanded," and uncertainties remain in the ability to characterize the spatial and temporal dynamics of hypoxia and the biological, chemical, and physical properties that contribute to it.
- Water quality monitoring in the Basin has not significantly increased and in some cases long term stations included in the USGS network have been discontinued. (*Action 5 of 2001 Action Plan*)
- Although some work has begun on the development of nutrient strategies at the sub-basin level, much work still needs to be accomplished. *(Action 6 of 2001 Action Plan)*
- Congress did not authorize and fund a reconnaissance-level study for the Army Corps of Engineers and partners to specifically assess the potential for nutrient reductions in federal (EPA, FWS, NRCS, USACE) river and farmland management, refuge management, and navigation projects. There has not been a Water Resources Development Act signed into law since 2000, and to date a non-federal sponsor has not been identified. (*Action 7 of 2001 Action Plan*)
- Additional analysis of detailed nutrient pollution contributions from multiple sectors, including point sources and non-agricultural contributions needs to be undertaken. (*Action 8 of 2001 Action Plan*)

UPDATING THE SCIENCE

The Task Force undertook a major reassessment of the state of the science for the causes, effects, and management actions for reducing Gulf hypoxia.

- In the fall of 2006, the Task Force agencies and the Sub-Basin Committees completed a series of four scientific symposia on the science surrounding Gulf hypoxia and nutrient sources, fate, and transport in the Mississippi/Atchafalaya River Basin.

- The Task Force completed a major technical report—A Science Strategy to Support Management Decisions Related to Hypoxia in the Northern Gulf of Mexico and Excess Nutrients in the Mississippi River Basin (Monitoring, Modeling and Research or MMR Report), published in 2004. The report describes a framework for MMR activities to support management decisions related to achieving the three major goals of the 2001 Action Plan. It describes the scientific information needed to support management actions and defines the scope, interrelation, and framework of the activities needed to provide that information. It also describes existing programs and activities, identifies gaps and limitations in those activities, and outlines the actions and resources needed to overcome the gaps and limitations.

- The Task Force completed a second major technical report—*The Management Action Review Team Report* (MART report), published in November 2006. The report is a compilation of information on point sources in the Mississippi River Basin and available programs that assist landowners, municipalities, and others in the basin to reduce nutrient loadings. It also shows how such programs could more effectively address nutrient reduction if they were aligned and integrated with the Action Plan. The MART report represents the first time the Task Force has compiled a snapshot of programmatic information, and thus it can be used as a resource for future reassessments.

- In August 2006 the Task Force asked EPA's Science Advisory Board (SAB) to provide independent advice on scientific advances since 2000 that might have increased understanding and options in three general areas:

  1. Characterization of the cause(s) of hypoxia. The physical, biological, and chemical processes that affect the development, persistence, and extent of hypoxia in the northern Gulf of Mexico.

  2. Characterization of nutrient fate, transport, and sources. Nutrient loadings, fate, transport, and sources in the Mississippi River that affect Gulf hypoxia.

  3. Scientific basis for goals and management options. The scientific basis for, and recommended revisions to, the goals proposed in the *2001 Action Plan*; as well as the scientific basis for the efficacy of recommended management actions to reduce nutrient flux from point and nonpoint sources.

CONCLUSIONS FROM THE REASSESSMENT

Taken together, the state-of-the-science symposia, MMR, MART, and SAB findings have advanced our understanding of hypoxia in the Northern Gulf of Mexico as well as the factors which contribute to it. Based on the complete reassessment of the science, the Task Force has agreed on the following main points which inform the actions in this plan:

- It is extremely important to accelerate actions that manage factors affecting hypoxia rather than waiting while science develops greater precision in revising the appropriate size goal for the hypoxic zone.

- The 5,000 square kilometer size of the hypoxic zone, the Coastal Goal set by the 2001 Action Plan, remains a reasonable goal in an adaptive management context; however, it may not be possible to achieve this goal by 2015. The hypoxic zone, measured in July 2007, was the third largest measured.

- While nutrients from the Mississippi-Atchafalaya River Basin coupled with temperature and salinity induced stratification are indicated as the primary *causes* of hypoxia in the NORTHERN GULF OF MEXICO, other factors contribute to increasing the amount of nutrients delivered to the Gulf, including:

  – Historic landscape changes in the drainage basin, primarily losses of freshwater wetlands, and increases in artificially drained areas that diminish the capacity of the river basin to remove nutrients, and

  – Channelization and impoundments of the Mississippi River throughout the basin and delta and the loss of coastal wetlands,

  – Changes in the hydrologic regime of the Mississippi and Atchafalaya Rivers and the timing of freshwater inputs that are critical to the stratification which is necessary for hypoxia. The diversion of a large amount of freshwater from the Mississippi River through the Atchafalaya has profoundly modified the spatial distribution of freshwater inputs, nutrient loadings, and stratification on the Louisiana-Texas continental shelf.

- Hypoxia has negative impacts on marine resources. Research on the deleterious effects of hypoxia on living resources in the Gulf suggest the occurrence of long term, ecological changes in species diversity, and possibly a regime shift (a large-scale, often rapid, reorganization of the entire ecosystem's food-chain that is difficult and often impossible to reverse).

- Phosphorus also contributes to hypoxia. New information has emerged that more precisely demonstrates the role of phosphorus in determining the size of the hypoxic zone, requiring strategies that address both nitrogen and phosphorus.

- Seasonal nutrient reduction strategies may be effective. Spring fluxes of nutrients to the Gulf are thought to be more important to hypoxia formation than fluxes during other times of the year. Strategies that provide more reduction of nutrients during the spring may be more effective in controlling hypoxia than strategies that provide a similar reduction spread throughout the year.

- Significant reductions in nitrogen and phosphorus are needed. To achieve the coastal goal for the size of the hypoxic zone, and improve water quality in the Basin, a dual nutrient strategy targeting at least a 45% reduction in riverine total nitrogen flux and in riverine total phosphorus flux, measured against the average flux over the 1980-1996 time period may be necessary.

- Total annual loads to the Gulf from 2001-2005 show a 21% decline in nitrogen flux, and a 12% increase in phosphorus flux when compared to averages from the 1980-1996 period. However, during the spring period (April, May, and June) most of the reduction

in total nitrogen flux was from nitrogen forms other than nitrate, an important form to fueling the primary production, leading to hypoxia development in the spring.

- Improved estimates of point and non-point source contributions are available: Newer information suggests that point sources represented 22% of nitrogen and 34% of phosphorus loads; resulting in a higher percentage of the total load to the Gulf from point sources than estimated in 1999. Accordingly non-point sources, including atmospheric deposition, represented 78% and 66% of nitrogen and phosphorus loads respectively.
- Anthropogenic nitrogen and phosphorus have declined. Net anthropogenic nitrogen inputs (NANI) and net phosphorus inputs for the Mississippi/Atchafalaya River Basin have declined in the last decade, because of more efficient use of fertilizer (as evidenced by increasing corn harvest and constant or declining fertilizer application rates). From 1999-2005, NANI calculations show 54% of non-point nitrogen inputs in the Mississippi/Atchafalaya River Basin were from fertilizer, 37% from fixation, and 9% from atmospheric deposition.

NEXT STEPS: GETTING RESULTS

ACTIONS TO ACCELERATE THE REDUCTION OF NITROGEN AND PHOSPHORUS

To reduce the size and impacts of the hypoxic zone and improve water quality in the Mississippi/Atchafalaya River Basin, landowners and resource managers must reduce nitrogen and phosphorus in the surface waters of the Mississippi/Atchafalaya River Basin. Although many other natural and seasonal factors contribute to the formation of the hypoxic zone, reducing nutrient loadings from the various sources in the basin addresses the most critical and controllable cause of hypoxia. No single action or strategy will achieve the necessary reductions. The optimal approach will take advantage of the full range and variety of actions to reduce nutrient loss to waters and increase nutrient retention and removal.

The work of the Task Force will continue to provide a basin-wide context for the continued pursuit of both incentive-based, voluntary efforts for nonpoint sources and existing regulatory controls for point sources. Improved coordination and, in most cases, continued expansion of the outstanding private and government supported efforts to reduce losses of nutrients are central to the success of this strategy. Throughout the Mississippi/Atchafalaya River Basin much work is underway to increase the efficiency of farming practices, reduce point and nonpoint sources of pollution and restore wetlands and riparian buffers. Landowners and managers primarily are taking these actions to achieve local water quality goals or implement conservation and management practices.

Even though current activities of landowners and managers will contribute to reducing the size of the hypoxic zone and improving basin water quality, they are not sufficient to meet the goals of this plan. Current funding for the necessary actions is insufficient. In addition emerging issues, such bio-fuels, climate change, changes in agricultural practices and new technologies for monitoring and modeling will have significant effects on the design and implementation of this plan. The Task Force has identified the actions listed below to encourage and advance the continued implementation of cost-effective, voluntary best management and conservation practices at the local and regional level — actions to both reduce loss of nutrients into the water and to reduce those loads once they exist. These actions are intended to support and add greater specificity to the actions begun under the 2001 Action Plan.

Each action describes the reasons for the action, the key players, and the process for implementing the action. Because many of these actions are beyond the scope of existing state and federal water quality and conservation efforts, they will achieve only limited progress without additional financial (and in some cases legislative) support. Therefore, the plan also includes a description of the "critical needs" — additional funding and analyses that are essential to achieve significant reductions in the

size of the hypoxic zone. The Task Force is committed to meeting these critical needs, wherever possible, and is publishing a separate, more detailed operating plan to guide the implementation of these actions.

1) Complete and implement comprehensive nitrogen and phosphorus reduction strategies for states, and appropriate basin-wide federal programs and projects. Target first those states with significant contributions of nitrogen and phosphorus to the surface waters of the Mississippi/Atchafalaya River Basin and ultimately to the Gulf of Mexico and those federal programs and projects with significant lead or co-implementation responsibilities.

Why do this?

Because the soils, hydrology, land use and cropping practices as well as the legal, legislative and administrative framework vary considerably across the 31 states in the Basin, the Task Force recognizes that no single approach to nutrient reduction would be effective in every state. All states already have programs to reduce nutrient losses from both point and nonpoint sources. However, while most states have plans within those programs to reduce their water quality problems, those plans are often focused on local or regional water quality. Existing plans may need to be modified to incorporate nitrogen and phosphorus reduction activities within the state to reduce loadings to the Gulf, while continuing to protect local water quality. These strategies will provide a road map for each state, a more detailed basis for budget development and implementation, and a vehicle for coordination with other states in the basin. Once the state strategies have been adopted by the broad reach of stakeholders throughout the states, and new funding is provided, Federal and State agencies and many involved stakeholders can accelerate their efforts to reduce nutrient impacts on local waters and the Gulf.

Similarly, Federal agencies have significant programs and projects that affect water quality in the Gulf and the basin. In some cases, a Federal agency may have direct lead for a specific activity, such as management of water flow and navigation on large, interstate rivers or management of fisheries. In other cases federal programs help to set the parameters of programs that are co-implemented or delegated to states, such as technology standards for wastewater treatment or criteria used as the basis for water quality standards. Broader Federal strategies are also needed to establish a context and approach to guide and coordinate the actions of these other partners. These strategies could include programs to identify effective nutrient reduction approaches, including streamlining regulatory requirements, utilize innovative funding mechanisms, and implement best management practices. For example, a federal strategy for restoration of the Mississippi/Atchafalaya River Basin's natural assimilative system would facilitate and help coordinate federal and state actions to implement the plan. These federal, basin-level strategies will help set a framework for individual state action and support collaborative efforts for program planning and implementation.

Who will take the lead?

Mississippi/Atchafalaya River Basin States, Federal Agencies

Who else will help?

Sub-basin teams, other regional groups

How do we do this?

Federal strategies for those programs and projects with the greatest impact on nutrient levels within the basin should be identified by June 2008 and completed by 2009. As part of the strategy, Federal agencies will identify opportunities to align existing programs with hypoxia efforts. For example, the USACE may look for opportunities to reduce nutrient loadings related to Corps projects and programs and be sure our environmental and related documents specifically address the hypoxia impact, take advantage of environmental projects to create wetlands and reconnect backwater and riparian zone areas to absorb nutrients, and better engage the research and development expertise in the Corps with awareness on reducing nutrient loadings related to Corps civil works projects. Another example, under the purview of USEPA, may involve the adoption of numeric water quality standards. Numeric water quality standards for nitrogen and phosphorus are essential for achieving the necessary reductions in nitrogen and phosphorus loading in the basin. Water quality standards provide the formulation for development of NPDES permit limits, TMDLs, and trading. In the near term, state adoption of numeric water quality standards for nitrogen and phosphorus for tributaries of the Mississippi and Missouri Rivers is expected to lead to reductions in nutrient loadings to these rivers and downstream in the Gulf of Mexico. More detail on each Federal agencies efforts will be documented in the Annual Operating Plan.

Nutrient reduction strategies for those states with the most significant contributions of nutrients to the Gulf and the corresponding watersheds with the largest contributions within those states should be completed and implemented as soon as possible, but no later than 2013. The development of state nutrient reduction strategies as prescribed by this plan is to be complementary to, and shall in no way delay or interfere with the progress of any existing or planned nutrient reduction activities. To further advance progress, the States should provide a project list for incorporation into the annual operating plans, identifying planned nutrient reduction activities and the corresponding availability and needs for funding.

Implementation of the Action Plan will require a significant level of commitment from the Federal agencies and State and local governments and increased awareness and action by the many varied stakeholders. The states, with information-sharing and coordination through the sub-basin committees, have the lead for implementing most of the programs that will achieve the goals of this Action Plan. Existing relationships with key stakeholders should be maintained and supported in developing and implementing strategies to reduce nutrient loads to the Gulf of Mexico and to water bodies within the Basin. The states are uniquely qualified to identify the key stakeholders who can influence opinion and support needed changes in practices and programs. State agencies have established relationships with their constituents, whether agricultural producers or regulated entities such as wastewater facilities. This approach will allow Federal and State

agencies and stakeholders in each of the states to focus on activities that will be most effective in their area.

What are the critical needs?

Federal agencies, working with the States and the Sub-basin committees, will need to establish incentives through the 319 program, Farm Bill programs or other federal funding sources to provide additional resources for the development and implementation of state-level nutrient reductions strategies. The opportunity may exist through the implementation of the 2007 Farm Bill for additional conservation technical assistance including: rapid watershed assessments to help prioritize use of limited financial assistance for producers, establishing a Regional Water Enhancement Program to provide funding to support development and implementation of water quality plans at the watershed scale, providing funding to support conservation innovation addressing nutrient reductions, and additional funding for working lands (EQIP) and wetland restoration, creation, and enhancement (CRP/WRP/CTA).

Ongoing analysis of the impacts of emerging issues on water quality, such as the increased production of biofuels, will be critical to ensuring that the nitrogen and phosphorus strategies will continue to improve water quality in the Mississippi/Atchafalaya River Basin and ultimately the Gulf of Mexico.

The States and Federal agencies must coordinate efforts across organizations and programs and use adaptive management to modify the strategies as new information and innovative solutions are acquired to identify critical watersheds, assess current conditions, and maximize potential nitrogen and phosphorus reductions with the most cost-effective approaches.

2) Utilize existing federal and state water quality and conservation programs to enhance protection of the Gulf and local water quality by incorporating considerations of multiple benefits into program decisions.

Why do this?

The guiding principle of this plan is that when establishing priorities for watershed restoration, States, Tribes and Federal agencies within the Mississippi/Atchafalaya River Basin will consider the potential for benefits to the Gulf of Mexico. This principle is especially important in the context of changes in agricultural markets such as the increased demand for corn for ethanol production that could have a substantial effect on nutrients delivered to the Gulf. Many federal, tribal and state programs offer the opportunity to enhance nutrient reductions, whether large water infrastructure projects or day-to-day decisions on zoning, permitting, and land use planning. However, most state, tribal and federal projects usually only address local water quality concerns. These entities need to ensure that these projects, including land and river management strategies, and flood control and navigation projects throughout the basin, also examine their effect on Gulf hypoxia as well as look for opportunities to increase the ability to reduce nutrients which harm local waters and the Gulf through design and operation changes.

Who will take the lead?

USACE, DOI, USEPA, USDA, Mississippi/Atchafalaya River Basin States

Who else will help?

Sub-basin teams

How do we do this?

Each Federal agency and State will identify opportunities for implementing cost effective nutrient reduction through existing programs. Two examples of how to do this are given below, although there are many other programs at each participating Federal agency that will need to be included.

One example of this is the manner in which USDA plans on addressing concerns about the effect increased biofuels production will have on nutrient loads to the Gulf. Management of agricultural lands in the Mississippi River Basin is not static but invariably changes in response to changes in the demand for agricultural commodities. USDA provides technical and financial assistance to farmers and ranchers to help them address environmental concerns associated with agriculture production. The technical foundation for this assistance is the development and application of conservation practice standards through several conservation programs that address a wide variety of environmental issues, in addition to water quality, and are designed to help maintain the sustainability of agricultural lands regardless of their use. Given the need for further reductions in nutrient loads to the Gulf, USDA will place additional emphasis on conservation practices with high potential for reducing nutrient loadings, such as nutrient management, cover crops, the siting of wetlands, and on-farm drainage water management in the delivery of its programs within the Mississippi Basin. This approach permits agriculture production to adjust to meet the changing needs of the market while maintaining the sustainability of the resource base and minimizing environmental effects.

USDA will encourage the increased use of our nutrient management standard to minimize nutrient loss from fields to help alleviate the impact of increased biofuels production on nutrient loads to the Gulf. The nutrient management standard requires farmers to account for all plant available nutrient sources immediately available or rendered available throughout the crop production cycle and apply only the amount of nutrients needed to maintain nutrient balances. Nutrient applications needed to maintain nutrient balances are based on realistic yield expectations and attempt to maximize profitable production. The use of cellulosic feedstocks, such as crop residues, perennial grasses and trees for biofuels production will require utilization of different conservation systems and conservation practice standards such as the one for residue management. USDA will continue to adjust current standards and develop additional standards, where needed, to permit cellulosic feedstocks to be produced and utilized in a sustainable manner.

Another example is the massive coastal protection/restoration program being undertaken by the State of Louisiana, the federal government and various stakeholder groups. The most critical element of this program involves retaining river sediment and river-borne nutrients within the coastal marshes to the greatest degree possible by redistributing river water throughout the delta before it reaches the Gulf of Mexico. Diverting river water

into the deltaic system on a large scale could provide an important sink for some of the excess nutrients that cause hypoxia through plant uptake, bacterial processing and sedimentation In addition, increasing the number of outlets for river water could significantly increase mixing in the coastal ocean and reduce salinity stratification and the setup conditions for hypoxia. There is substantial evidence that such a program would save wetlands now in jeopardy, and increase productivity and sequestration of both nutrients and carbon.

While apparent "win-win" strategy is complex and expensive, authorization and funding for Louisiana's critical river diversion program has garnered broad public support. There are, however, serious environmental concerns about releasing huge volumes of nutrient-rich river water into the estuarine zone instead of into the nearshore ocean where it goes today. Thus river diversions could be postponed until nutrient levels are significantly reduced upstream, which could undermine the restoration of what has come to be known as "America's Wetland."

What are the critical needs?

These critical needs will be further defined in the final version of the 2008 Action Plan.

ACTIONS TO ADVANCE THE SCIENCE, TRACK PROGRESS AND RAISE AWARENESS

The Task Force identified other actions to achieve their goals and improve awareness of the efforts to address hypoxia in the Gulf of Mexico. These actions will improve the effectiveness of nutrient reduction and track and report on the results of the effort. They emphasize the crosscutting nature of the problem and recognize the diversity of actions that must be accomplished to achieve the goals and the need to track and respond to progress.

These additional actions advance the adaptive management approach and periodically reassesses the state of the science, keep track of progress of both environmental measures and programmatic actions, and seek to continually engage involved stakeholders to maximize results. Since the *2001 Action Plan*, researchers have advanced the understanding of nutrient transport and fate in the Mississippi/Atchafalaya River Basin and the consequences on Mississippi/Atchafalaya River Basin water quality and the northern Gulf of Mexico's hypoxic zone. States and Federal agencies will seek to further advance science in the priority needs recommended in the MMR and SAB reports. Furthermore, effective implementation of this action plan will require a monitoring and tracking of progress. Finally, the *2008 Action Plan* is the result of several years of study and discussion by the members of the Task Force and many concerned officials, organizations and citizens who participated in the deliberations. Given the cooperative and voluntary nature of the *2008 Action Plan*, its implementation will be dependent upon broad acceptance and a willingness to pursue the identified actions. The engagement of stakeholders will continue to be a priority.

The following actions implement the principle of adaptive management for this strategy:

3) Develop and promote more efficient and cost-effective conservation and management practices for conserving nutrients within the Mississippi/Atchafalaya River Basin watershed and evaluate their effectiveness at all scales beginning with local watersheds and aggregating them up to the scale of the Mississippi/Atchafalaya River Basin.

Why do this?

Understanding the most efficient and cost-effective conservation and management practices to reduce nutrient loads is central to the success of nutrient reduction strategies. We need to be able to identify effective management practices and technologies including conservation practices at the local scale, and large-scale federal approaches to enhance the biological removal of nutrients, incorporate changing contexts in conservation and management practices, and accurately assess the economic costs and benefits of different approaches.

Who will take the lead?

USDA (ARS, CSREES, NRCS, FSA), Mississippi/Atchafalaya River Basin States, USACE

Who else will help?

USEPA, USGS

How do we do this?

(1) Continue to develop field and farm scale management practices that conserve nutrients for the wide range of agricultural production systems within the Mississippi/Atchafalaya River Basin.

(2) Quantify the effectiveness of conservation practices within local watersheds that are representative of the wide range of soils, climates, and farming systems within the Mississippi/Atchafalaya River Basin.

(3) Review, update, or develop USDA NRCS national and state conservation practice standards for the practices most effective in conserving nutrients.

(4) Assist State Extension, USDA personnel and agricultural consultants in delivering nutrient conserving practices to farmers and ranchers within the Mississippi/Atchafalaya River Basin.

What are the critical needs?

– Obtain the resources necessary to quantify at the watershed scale the efficacy of newly evolving nutrient control strategies proven effective at plot and field scales to ensure that these strategies produce equivalent benefits at the landscape scale.

- Obtain resources necessary to use the Conservation Effects Assessment Project (CEAP) Watershed Network to monitor and assess how changes in agricultural practices driven by future market and other forces may affect efforts outlined above to reduce nitrogen and phosphorus inputs to the Gulf of Mexico. Progress towards reducing nutrient loads from agricultural lands could be assessed annually.
- Obtain resources/priority for the development and implementation of strategies to use National Resources Inventory (NRI)/CEAP for monitoring progress regarding reducing nutrient loads from agricultural land management activities to provide 5-10 year estimates with trends.

4) Identify and, where possible, quantify the effects of the hypoxic zone on the economic, human and natural resources in the Mississippi/Atchafalaya River Basin and Northern Gulf of Mexico, including the benefits of actions to reduce nitrogen and phosphorus and the costs of alternative management strategies.

Why do this?

Researchers have greatly expanded our understanding of the effects of hypoxia, however much uncertainty remains, specifically concerning the indirect biological and socio-economic effects of hypoxia and excess nutrients throughout the Mississippi/Atchafalaya River Basin, and on the Gulf.

Within the basin, as we make progress reducing nutrient loads we need to better understand the changes that are occurring, their effects on the ecosystem and its economic resources, the costs and benefits of seeking additional reductions in loads throughout the basin, and the additional effects that reductions in nitrogen and phosphorus may have on the economic and social welfare of the Mississippi/Atchafalaya River Basin.

Research into the impacts of the hypoxic zone on living resources is authorized through the Harmful Algal Bloom and Hypoxia Research and Control Act (HABHRCA). Within the Gulf ecosystem there is evidence that an ecological regime shift, associated with the expansion of hypoxia in the Northern Gulf of Mexico, has occurred. Effects of the hypoxic zone on fisheries and ecologically important species are often likely to be indirect, and difficult to measure. Spatially-explicit ecosystem models are needed to quantify these indirect effects and their consequences on fisheries and ecologically important populations. Economic analysis of these impacts will improve resource assessments and help us to better quantify the socioeconomic benefits of nutrient reduction achievements in the MRB.

Who will take the lead?

USDA, NOAA, USACE, USEPA

Who else will help?

DOI, LA, MS, TX

How do we do this?

(1) Conduct an economic assessment of alternative options for reducing nutrient loads;

(2) Identify and assess the ancillary environmental effects of the alternative options for reducing nutrient loads;

(3) Improve quantification of the indirect effects of hypoxia on living resources, especially those related to interactions with additional stressors (e.g. fishing and climate change), to inform model development and management strategies;

(4) Quantify the socioeconomic effects of hypoxia on coastal communities along the northern Gulf of Mexico, especially impacts to commercial and recreational fisheries;

(5) Track progress to support future science assessments.

What are the critical needs?

- Continued resource allocation for a USDA Hypoxia Economic Analysis to assess the socio- and bioeconomic implications of varying nutrient management scenarios.
- Expansion of resources for ecological impacts studies on commercially and ecological important species, such as those funded by NOAA's NGOMEX program, to advance model capabilities that predict the impacts of hypoxia.
- Coordination and expansion of faunal monitoring surveys, such as SEAMAP, with increased resource allocations for fishery independent data on commercially and ecologically important fish and shellfish species.
- Quantified nutrient loading threshold and corresponding ecological response to determine the magnitude of ecological system resiliency (i.e. point of regime change) within the northern Gulf.

5) Coordinate, consolidate and improve access to data collected by State and Federal agencies on Gulf Hypoxia and Mississippi/Atchafalaya River Basin program activities and results.

Why do this?

Currently many agencies are independently collecting, storing and reporting information on progress and activities. The Task Force has committed to ensuring that data collection methodologies are better described to aid reporting and ensure data comparability. In particular, some significant sources are not consistently collected or reported leading to misunderstandings of their contributions to the total load to the basin and Gulf.

Who will take the lead?

USEPA, USGS, NOAA

Who else will help?

USACE, Mississippi/Atchafalaya River Basin States, Sub-basin teams, UMRBA, LMRCC, ORSANCO, Gulf Alliance

How do we do this?

(1) Define information needs and design a strategy to satisfy those needs in a comprehensive and interdisciplinary manner that brings scientists and resource managers together from a range of disciplines and perspectives, including from Gulf and Basin perspectives,

(2) Gather and disseminate needed scientific information in a manner that is cost effective, takes advantage of all existing activities, and explains the practical value of synergies gained from actions taken to address both local water quality and the quality of receiving waters,

(3) Provide information gathered from monitoring, modeling, and research related to Gulf hypoxia, Basin water quality, and social and economic factors in a form and a timeframe that feed directly into complementary scientific interpretations, management planning, and implementation and,

(4) Share, among scientists and managers, all information relevant to improving research and management decision-making, including those decisions that may be directed primarily at other issues indirectly related to hypoxia, but which will contribute to achieving Action Plan Goals.

What are the critical needs?

Current activities are unlikely to resolve serious inconsistencies or provide additional data from unmonitored sources. Additional work is needed to define processes for acquiring, documenting, storing and accessing data. Particularly, we need to develop and implement programs to measure nitrogen and phosphorous discharges from non-agricultural sources for which data are not currently collected, such as Municipal Water Treatments Systems, industrial, urban wet-weather, and air deposition sources, develop and implement strategies for using NRI/CEAP to monitor progress regarding reducing nutrient loads from agricultural land management activities, design and implement a coordinated, ongoing state and federal sustainable monitoring program as recommended in the MMR for the hypoxic zone and for the fresh waters of the Mississippi/Atchafalaya River Basin that would allow comprehensive temporal and spatial data acquisition to assess progress.

6) Track interim progress on the actions to reduce nitrogen and phosphorus by producing an annual report on federal and state program nutrient reduction activities and results.

Why do this?

There remain serious gaps in our ability to track and evaluate the effectiveness of programs and management efforts and their interactions in reducing the hypoxic zone. More attention should be paid and resources expended on improving the understanding

of which efforts are the most effective, and how effective they are so we can better design and target future actions.

Who will take the lead?

USEPA

Who else will help?

CC, USDA (NRCS)

How do we do this?

(1) Identify existing methods that can quantify the results of the existing suite of best management and conservation practices, and adapt or modify them to quantify best management and conservation practices used in the Mississippi/Atchafalaya River Basin that will impact hypoxia,

(2) Coordinate with NRCS to collect state and federal implementation data,

(3) Use data to annually evaluate the effectiveness of programs and management efforts

What are the critical needs?

- Consistent data that is standardized across programs
- Authority and staff, financial or in-kind support

7) Continue to reduce existing scientific uncertainties identified in the SAB and MMR reports regarding source, fate and transport of nitrogen and phosphorus in the surface waters of the Mississippi/Atchafalaya River Basin to continually improve the accuracy of management tools and efficacy of management strategies for nutrient reduction.

Why do this?

Gaps still exist in the science surrounding source fate and transport of nitrogen and phosphorus in the Mississippi/Atchafalaya River Basin. Eliminating these gaps is essential to the creation and implementation of effective nutrient reduction strategies.

Who will take the lead?

USEPA

Who else will help?

USDA, USGS, USACE, Mississippi/Atchafalaya River Basin States

How do we do this?

(1) Evaluate and rank the scientific uncertainties and monitoring needs identified in the MMR, the SAB report and other information

(2) Create long term research and monitoring strategy

(3) Implement research and monitoring strategy

(4) Track progress to support future science assessments

What are the critical needs?

These critical needs will be further defined in the final version of the 2008 Action Plan.

8) Continue to reduce uncertainty about the relationship between nitrogen and phosphorus loads and the formation, extent, duration, and severity of the hypoxic zone, to best monitor progress toward, and inform adaptive management of the Coastal Goal.

Why do this?

Researchers have greatly expanded our understanding of the physical dynamics of the Gulf of Mexico and the causes of hypoxia, providing additional evidence that supports the strategy to reduce the size of the hypoxic zone by reducing nutrient loading to the Gulf. However, improved characterization of nutrient flux and hypoxic zone properties is needed to further refine management strategies. As we make progress at reducing nutrient loads, improved precision in understanding the effects of a dual nutrient strategy for the hypoxic zone is needed to best inform quantitative load reduction goals that will be required to reach the Coastal Goal. Improvements in hypoxic zone monitoring are needed to better characterize its magnitude and the processes that lead to its development, maintenance, and distribution as well as its impacts. Greater temporal and spatial coverage in monitoring efforts are needed to account for variability and pre-cruise storm events, define boundaries, characterize seasonality, and support modeling efforts. Improvements are needed in the accuracy of models forecasting the quantitative association between biological, chemical and physical processes and hypoxia development, magnitude, and extent.

Who will take the Lead?

NOAA

Who else will help?

USEPA

How do we do this?

(1) Evaluate and rank the scientific uncertainties and monitoring needs identified in the MMR, the SAB report, the White Paper to Improve Monitoring of the Gulf of Mexico Hypoxic Zone in Support of the Hypoxia Task Force's Coastal Goal, and other information;

(2) Develop and implement a long term research and monitoring strategy under the MMR Workgroup of the Coordinating Committee with greater emphasis on the spatial and temporal extent of the hypoxia zone;

(3) Reduce uncertainties associated with predictive models allowing for improved adaptive management capabilities;

(4) Integrate monitoring, modeling, and experimental results to understand the impacts of nutrient management actions on the spatial and temporal characteristics of the hypoxic zone;

(5) Track progress to support future science assessments.

Critical Needs

- Understanding of nutrient cycling and transformations (with emphasis on quantifying the lag time between reductions in nutrient loadings and reductions in the extent of the hypoxic zone.
- A long-term and sustainable hypoxic zone monitoring program, with adequate spatial and temporal coverage. Critical components of this need include;
- Increasing the number of shelf-wide monitoring surveys beyond the current one per summer with increased number of sampling stations and greater area surveyed;
- Additional in situ platform based continuous monitoring devices (observing systems);
- Mechanism to transition monitoring from a research to an operational framework.
- Improved predictive modeling capabilities.

9) Promote effective communications to increase awareness of hypoxia and support the activities of the Task Force.

Why do this?

There are many invested stakeholders in the effort to reduce hypoxia. While the Task Force has effectively communicated with its member states and agencies, national recognition of the issue and widespread implementation of management practices - two critical aspects to the ultimate resolution of Gulf hypoxia - will require increased cooperation and understanding from other stakeholders throughout the country. Regular, effective, and strategic communications, through public meetings, annual reports, and communications vehicles will be important components of outreach efforts to expand public awareness.

Who will take the lead?

USEPA

Who else will help?

USDA (NRCS), USACE, Mississippi/Atchafalaya River Basin States

How do we do this?

(1) Create and maintain a website for accessing current information on Task Force activities, status of actions, and all associated monitoring, modeling, and research plans and products;

(2) Identify and promote existing communication tools for outreach and education that are deemed most effective in reducing nutrients;

(3) Develop and distribute annual report for the general public and TF describing the condition of the Mississippi/Atchafalaya River Basin, Gulf hypoxic zone, actions accomplished, and objectives for the next year.

What are the critical needs?

A Strategic Communications Plan that outlines a process and focuses on effective outreach to both the general public and specific stakeholders. The Communications Plan will focus on:

- Creating and maintaining a website for accessing current information on Task Force activities, status of actions, and all associated monitoring, modeling, and research plans and products;
- Identifying and promoting existing communication tools for outreach and education that are deemed most effective in reducing nutrients;
- Developing and distributing an annual report for the general public and TF describing the condition of the Mississippi/Atchafalaya River Basin, Gulf hypoxic zone, actions accomplished, and objectives for the next year;
- Developing and distributing communications materials for the general public.

The TF Communications Plan can be assembled using existing staff resources. Under current levels of funding, communications efforts will remain status quo and relatively limited and will not meet the goal of expanding public awareness of Gulf Hypoxia and the publication of the Action Plan. To reach a broader audience, several activities outlined by the Task Force can be strengthened with a relatively modest increase in funding by engaging communications/media specialists and increasing publication of communication pieces and outreach materials to communicate the ongoing efforts of the TF.

10) In five years (2013) reassess nitrogen and phosphorus load reductions, the response of the hypoxic zone, changes in water quality throughout the Mississippi/Atchafalaya River Basin, and the economic and social effects, including changes in land use and management, of the reductions in terms of the goals of this Action Plan. Evaluate how current policies and programs affect the management decisions made by industrial and agricultural producers, lessons learned and determine appropriate actions to continue to implement or, if necessary, revise this strategy.

Why do this?

The Task Force has always been committed to adaptive management as we continue to implement strategies to reduce hypoxia. Because of the tremendous scientific attention the Gulf and Mississippi/Atchafalaya River Basin draw, as well as the rapidly changing practices surrounding bio-fuels, changing climate and national economics, the Task Force feels that a significant reassessment is necessary every five years.

Who will take the lead?

USEPA

How do we do this?

(1) Determine reassessment strategy by FY2009

(2) Identify quantitative measures of in-basin nutrient reductions that exhibit progress towards both the "Within Basin" and "Coastal" goals. Measures will be developed at the State level with support as necessary from Federal agencies. Further detail will be provided in the annual operating plan.

(3) Identify scientific needs and financial and staff resources according to reassessment strategy

(4) Implement reassessment strategy

What are the critical needs?

These critical needs will be further defined in the final version of the 2008 Action Plan.